Models test

IB11

Non-calculator section.

Name:____

Remember to show your work in every exercise.

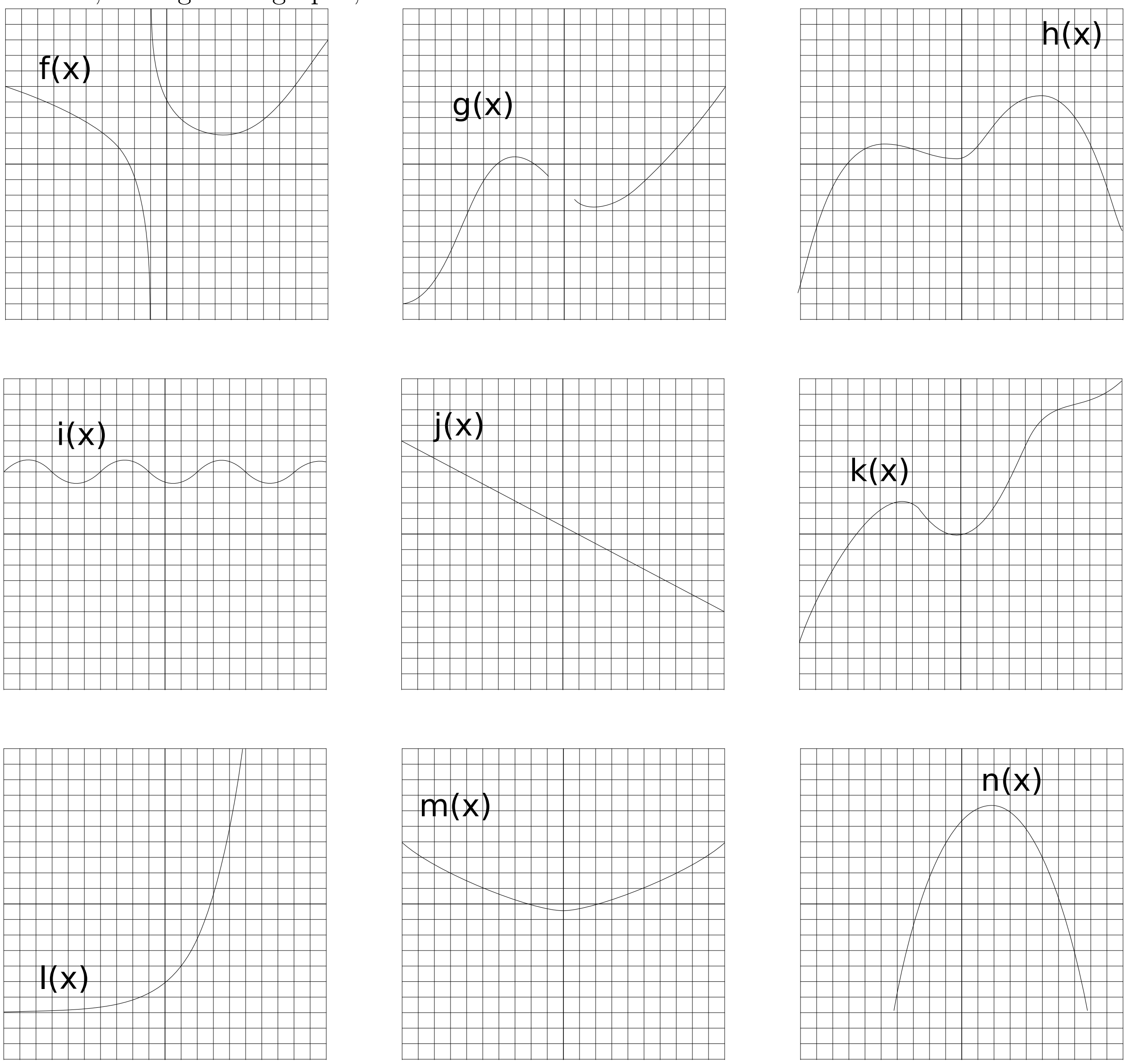
1. Define "function"(0 1 0)

2. Find the domain of the function $a(x) = \frac{1}{x^2-4}$ (0 1 0)

3. Find the range of the function $b(x) = x^2 - 4$ (0 1 0)

4. Bonus question: The function $c(x) = \sqrt{x^2 - x - 4}$ doesn't domain for the whole set of $\mathbb{R}$. Find the domain and explain the domain restriction. (0 1 0)

5. Is there, among these graphs, a function that...



a) When you give it 6 it gives back 8 (0.5 0 0)

b) Has a horizontal asymptote. (0 0.5 0)

c) Has a vertical asymptote (0 0.5 0)

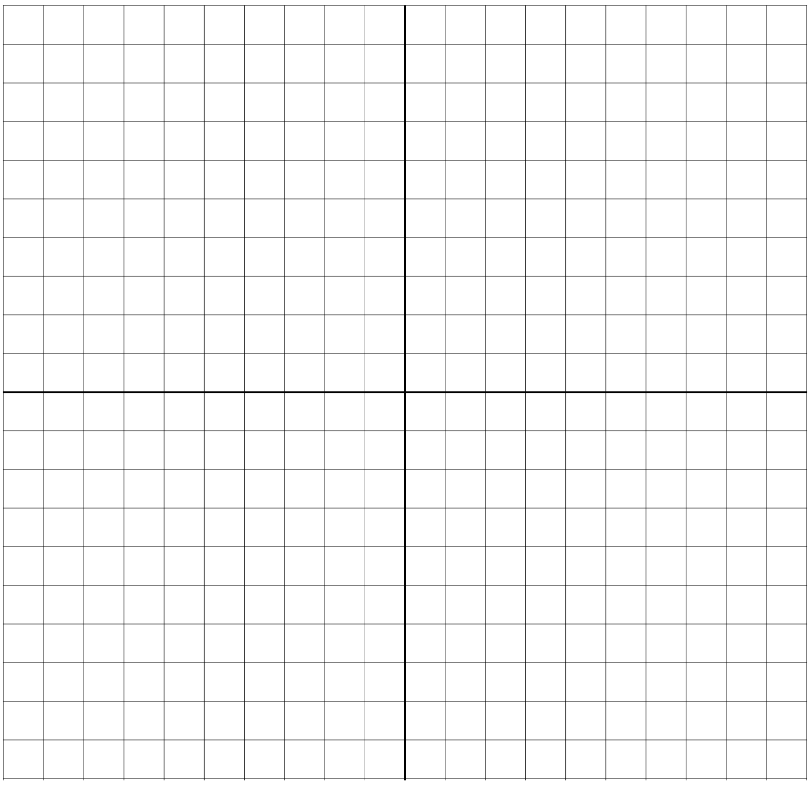
d) Never gives back the value 0 (0 0.5 0)

e) Is not really a function (0 0.5 0)

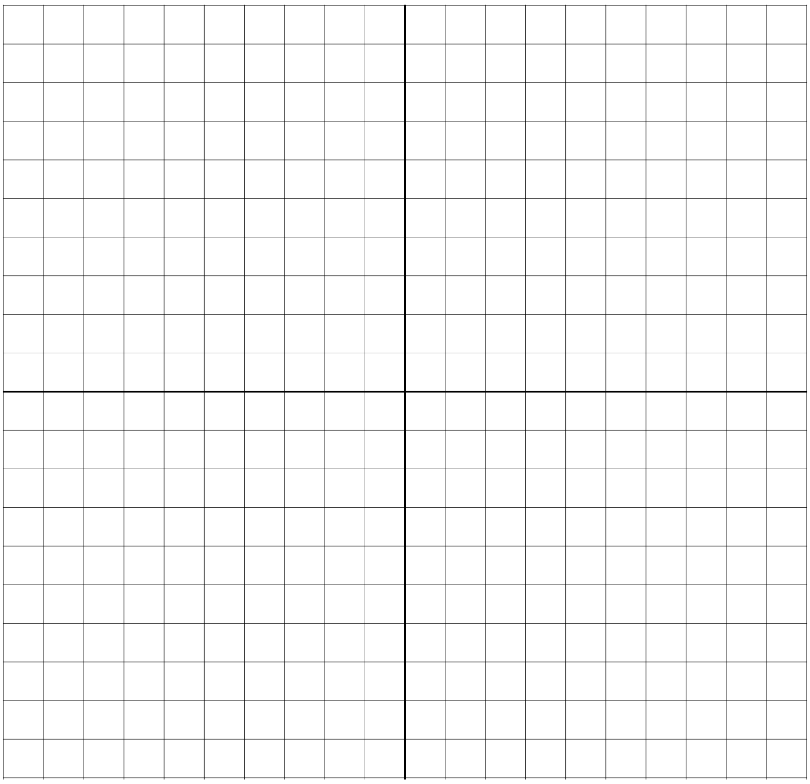
f) Is a quartic function (0 0.5 0)

6. Calculate the equation of the linear function that passes through the points (1,0) and (-5,3). (0 1 0)

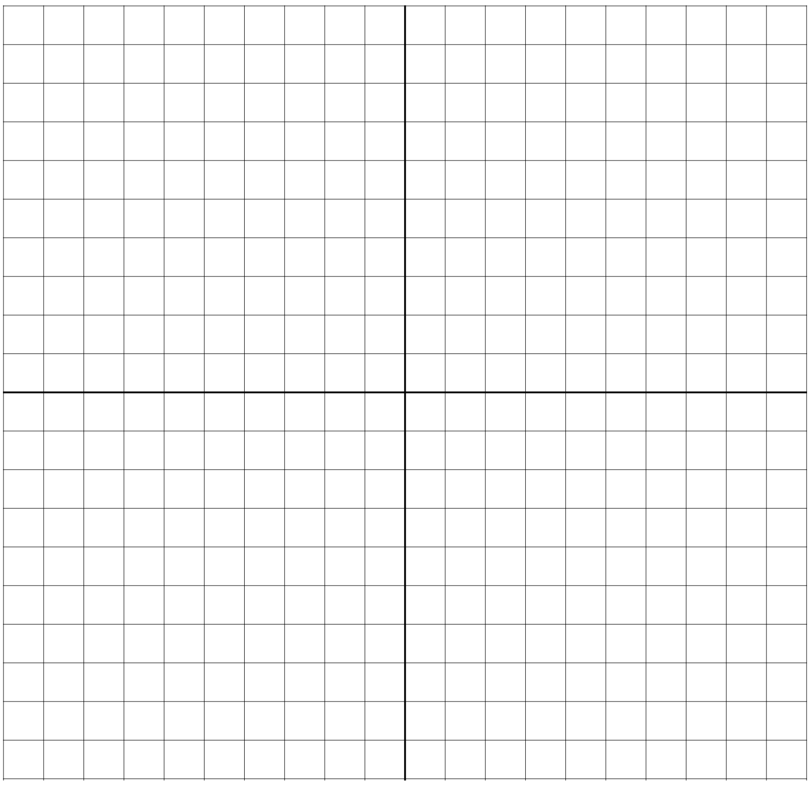
7. Sketch the function $o(x) = 5x - 7$ (0 1 0)



8. Sketch the parabole $p(x) = x^2 - 4x + 5$ by finding its apex and intersections with the axis (0 2 0)



9. Bonus question: sketch the parabole $p(x) = x^2 - 2x + 4$ by finding its apex and intersections with the axis (0 1 0)



Models pretest

IB11

Calculator section.

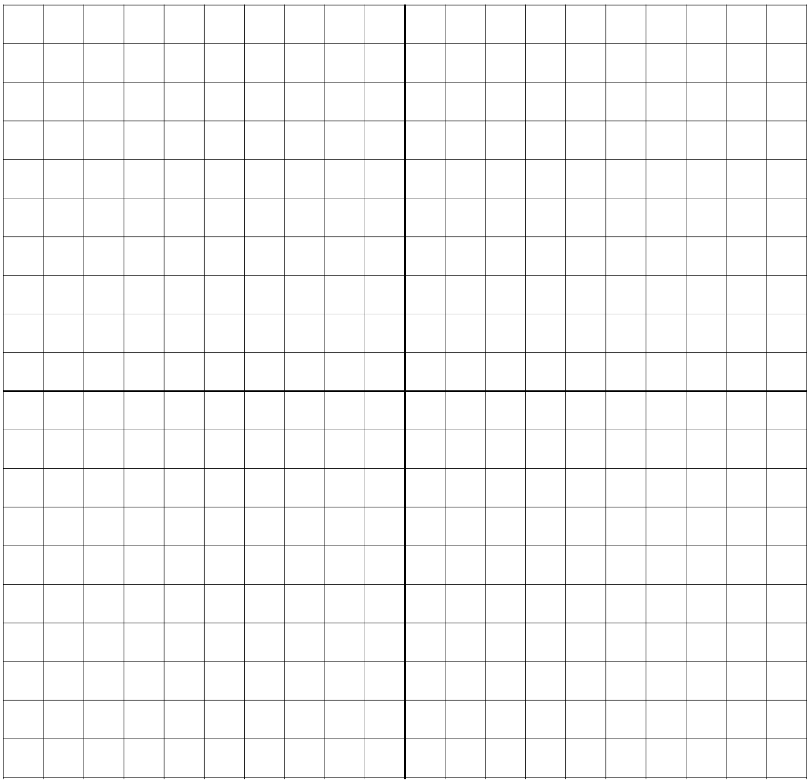
10. Rincewind the "wizzard" is being held at swordpoint by a guard of the Agatean empire and he intends to run for it, as usual.
The guard is on horseback and, since horses need a short while to arrange their legs, they start moving slowly and then faster. Their movement can be modelled by the function $q(x) = 0{,}2x^2$ (x is the time in seconds) while Rincewind runs at 5 meters per second.

    a) Establish a model for Rincewind's movement. (0 1 0)

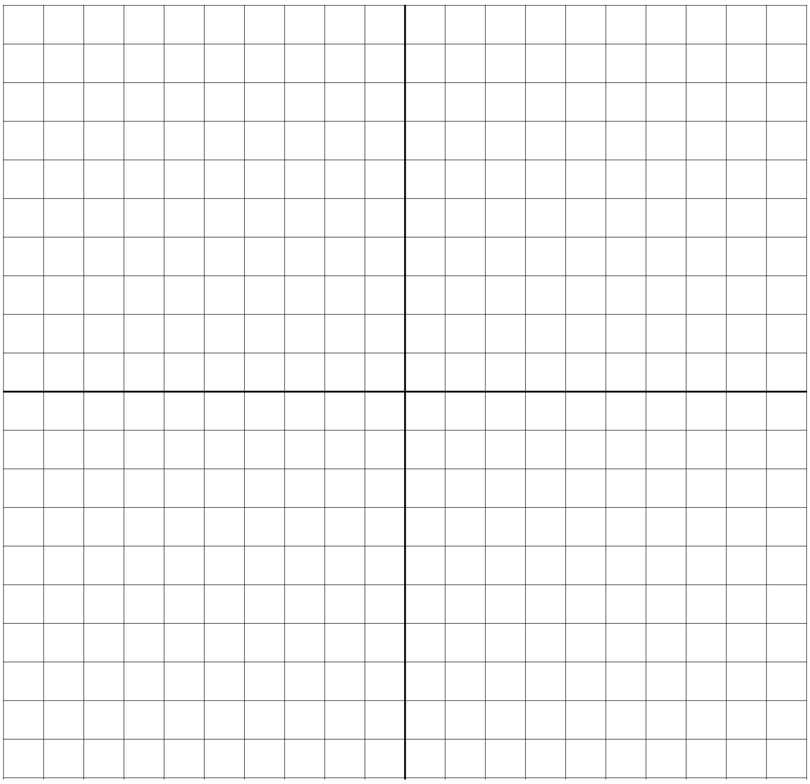
    b) Find the position of both after ten seconds. (0 1 0)

    c) When will the guard catch Rincewind? (0 0 1) *d*) How many meters will he have covered by then? (0 1 0)

11. Draw the parabole $s(x) = -0{,}25x^2 + 2x + 3$ (1 0 0)



12. Draw the function $t(x) = 3 \cdot 0{,}8^x + 3$ (0 1 0)



13. An electric resistor gets hot when electric current passes through it. As it happens with most resistors, the hotter it gets, the more it opposes the passage of electricity, so it gets even hotter and eventually burns and breaks. The whole thing happens quite quickly, so the time will be expressed in milliseconds (ms). Every millisecond the temperature rises by 2 % and the initial temperature is 340K. The resistor will burn and break when it reaches 1200K.

    a) Establish a function that works as a model of this behaviour.(1 0 0)

    b) Use the model to predict the temperature of the resistor after 20 ms.(0 1 0)

    c) How long before the resistor burns and breaks?(0 1 0) *d*) Bonus question: Establish a model for the resistor cooling down assuming an initial temperature of 800K, the air around it being at 300K and the difference of temperatures between them decreasing by 4 % per second. (0 0 1)

14. Solve, using the calculator, the equation $1{,}5^{(-x-2)} + \frac{2}{x^2-4x+4} + \frac{x}{2} = 1$ (Give answer accurate to at least 2 decimal points)(0 1 0)

15. Bonus question: solve, using the calculator, the equation $1{,}5^{(-x-2)} + \frac{2}{x^2-4x+4} + \frac{x}{2} = 5$(Give answer accurate to at least 2 decimal points)

16. A solar power plant suffers a decrease in temperature during the night and then an increase upon sunrise. The temperature can be modelled by:
$v(x) = -1{,}5x + 1{,}8^{x-6} + 5$ where x is the time in hours and the temperature is measured in degrees Celsius.

   a) Find when the temperature is lowest (round it to the nearest hundredth of hour).(0 1 0)

   b) Find the lowest temperature (round it to the nearest tenth of degree celsius).(0 1 0)